

Development of a Rural Road Note (RRN) on Pavement Design Methods for Low Volume Rural Roads

Inception Report



TRL

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Abstract

Pavement design is a major part of the road provision process. The design of pavements has a major impact on the cost of the provision of low volume rural roads. There are four major pavement design methods available for the design of low volume rural roads, the CBR Method, the Structural Number Method, the DCP-DN method, and the DCP-CBR Method. Many of these methods require different design inputs. Often these design methods lead to different design thicknesses and materials requirements.

Apart from the materials characteristics, the performance of pavements is affected by other natural factors such as climate and geotechnical aspects. Consideration of these major factors in the design of low volume roads allows for the correct provision of drainage, foundations, and maintenance plans.

All these options and considerations lead to different pavement options. The designer must therefore consider a number of factors to evaluate the pavement options obtained from the different design methods. The factors include the life-cycle costs and benefits, the availability of materials, availability of construction technology amongst other factors before final selection of the preferred alternative.

This project aims at developing a Rural Road Note on pavement design methods for low volume rural roads. It will be developed in such a way that a designer will be able to compare design options using a systematic approach before final selection of the preferred option.

Key words

Low volume roads, Pavement design, Natural materials, Climate resilience, Geotechnical considerations

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Research for Community Access Partnership (ReCAP)

Safe and sustainable transport for rural communities

ReCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa and Asia. ReCAP comprises the Africa Community Access Partnership (AfCAP) and the Asia Community Access Partnership (AsCAP). These partnerships support knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. The ReCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

www.research4cap.org

Acronyms, Units and Currencies

| | |
|--------|---|
| \$ | United States Dollar (US\$ 1.00 ≈ provide conversion to local currencies) |
| AASHTO | American Association of State Highway and Transportation Officials |
| ADB | Asian Development Bank |
| AfCAP | Africa Community Access Partnership |
| AFCAP | Africa Community Access Programme |
| AsCAP | Asia Community Access Partnership |
| CBR | California Bearing Ratio |
| CIRIA | Construction Industry Research and Information Association |
| DCP-DN | Dynamic Cone Penetrometer – DCP Number |
| DfID | Department for International Development of the United Kingdom |
| FHWA | Federal Highway Administration |
| GPS | Global Positioning System |
| HDM-4 | Highway Design and Management |
| LVR | Low Volume Roads |
| LVRR | Low Volume Rural Roads |
| LVSR | Low Volume Sealed Roads |
| LTPP | Long-Term Pavement Performance |
| ORN | Overseas Road Note |
| PIARC | Permanent International Association of Road Congresses |
| ReCAP | Research for Community Access Partnership |
| RRN | Rural Road Note |
| SADC | Southern African Development Community |
| SEACAP | South East Asia Community Access Programme |
| SWG | Stakeholder Working Group |
| ToC | Table of Contents |
| ToR | Terms of Reference |
| TRH | Technical Recommendation for Highways |
| TRL | Transport Research Laboratory |
| UK | United Kingdom (of Great Britain and Northern Ireland) |
| UKAid | United Kingdom Aid (Department for International Development, UK) |
| UKDCP | United Kingdom Dynamic Cone Penetrometer |
| US | United States |
| VOC | Vehicle Operating Cost |

Executive summary

This report describes the main activities that were undertaken during the inception stage of the project. The project was launched on the 15th May 2019 and is scheduled to be completed by 20th May 2019.

The main aim of the project is to develop a concise Rural Road Note (RRN) on pavement design methods for low volume rural roads. This will draw on the strength of the low volume roads manuals that have been developed for a number of ReCAP partner countries. It will also draw on a number of other manuals and design documents such as Overseas Road Note 31 (ORN31), Design Manual for Low Volume Sealed Roads Using DCP-DN for Malawi, and the Technical Recommendation for Highways 14 (TRH14). Research studies, especially those conducted under ReCAP will also be used in the development of the RRN. Examples of such studies include the Back Analysis Project (RAF2069A), the Climate Resilience Project (GEN2014C), the LTPP Project (GEN2132A) and others from AFCAP 1 and SEACAP.

During the inception stage a desk study was carried out to identify reference documents that will be used during the literature review to produce the RRN. The reference documents were selected through a light review of several documents to identify what information could be obtained from each of the documents. A short list was then made.

Eight members of the Stakeholder Working Group (SWG) were proposed to assist with development of the RRN. The main duties of the SWG are to provide technical advice and recommendations for appropriate structure, layout and content of the RRN, propose any documents that may contribute to the development of the RRN, review the draft RRN, attend review meetings, and assist in resolving any technical matters. The Terms of Reference for the SWG has been drafted and provided in Annex 2 of this report.

1 Introduction

1.1 Background

The consolidation of pavement design methods underpinning the various national Low Volume Road (LVR) manuals that have been developed in DFID-funded rural transport programmes, such as Research for Community Access Partnership (ReCAP), South East Asia Community Access Programme (SEACAP) and Africa Community Access Programme-1 (AfCAP-1), is a worthwhile initiative since it would consolidate the knowledge gained from these programmes. Under the ReCAP programme, LVR manuals covering pavement design have been developed for several countries in Africa (Ethiopia, South Sudan, Zambia, Tanzania, Mozambique, Malawi, Kenya, Ghana, Sierra Leone and Liberia). In Asia, the Bangladesh LVR design manual has been reviewed and revised in line with the latest LVR design philosophy and a new manual is being developed for Myanmar. Most of these manuals were developed with reference to existing documents such as Low Volume Rural Surfacing and Pavements – A Guide to Good Practice; TRL’s UKDCP 3.1 Manual Measuring Road Pavement Strength and Designing Low Volume Sealed Roads (LVSRs) using the Dynamic Cone Penetrometer; TRL Overseas Road Note (ORN) 31 and Southern African Development Community (SADC) Pavement Design Guidelines; among others.

In addition to these manuals, several regional research projects relating to pavement design of Low Volume Rural Roads (LVRRs) have been undertaken under the ReCAP programme. These research projects include the Development of Guidelines and Specifications for Low Volume Sealed Roads through Back Analysis (RAF2069A); Road Materials and Aggregate Inventory Database (RAF2101A); Climate Adaptation: Risk Management and Resilience Optimisation for Vulnerable Road Access in Africa (GEN2014C); amongst others. With the ReCAP programme due to complete in 2020, it is essential that the LVRR pavement design aspects covered in the different national LVR manuals are integrated and aligned with findings from the regional research projects on LVRRs into one document. This project on the ‘Development of a Rural Road Note (RRN) on Pavement Design Methods for Low Volume Rural Roads’ will therefore address this need for consolidation of information on pavement design of LVRRs.

The proposed RRN will not only enable practitioners to access all the relevant information on pavement design methods for LVRRs in one document, but also support structuring and implementation of future regional projects in the African and Asian continents. Moreover, its enrichment with the latest findings from on-going research projects will add value and relevance in the design process of LVRRs. The ideal RRN would be a concise document, whose content can easily be retrieved and applied by design engineers. In the past decades, TRL has developed comprehensive but succinct and high quality Overseas Road Notes (ORNs) that have been widely applied in Africa, Asia and beyond. For instance, the ORN 31 (A Guide to the Structural Design of Bitumen-Surfaced Roads in Tropical and Sub-tropical Countries) is only 74 pages long and the ORN 18 (A Guide to the Pavement Evaluation and Maintenance of Bitumen-Surfaced Roads in Tropical and Sub-tropical Countries) is only 67 pages. TRL intends to maintain these standards during the development of the proposed RRN with due cognisance of the fact that previous documents focussed on one design method in great detail, whilst the RRN provides an outline of each of the several design methods currently in existence.

TRL aims to deliver the RRN and related activities in 12 months as indicated in the terms of reference.

1.2 Aim and objectives of the project

The overall objective of this project is to develop a concise Road Note on the Pavement Design Methods currently in the designers’ “tool box” for LVRRs.

The specific objectives will include:

- Identifying and reviewing suitable reference documents for the development of the RRN;
- Outlining all available methods that can be used for pavement design of LVRRs;
- Demonstrating the limitations of each design method including the environment in which the methods are most suitable for application;
- Providing procedural guidance for application of the pavement design methods; and

- Assessing the current status of the reference documents and indicating any updates that need to be made in order to make them compatible with the RRN.

It is expected that the final RRN will not exceed 200 pages.

2 Approach and Methodology

2.1 General

In order to deliver the objectives of the project, fifteen main tasks have been identified. The tasks fall under two phases of the project, the document scoping phase and the document development phase.

The project will be delivered in two phases. Phase 1 will mainly involve scoping of the RRN and Phase 2 will focus on its development. The following tasks are envisaged across the two phases of the project:

1. Project Launch Meeting
2. Constitution of the SWG and development of their terms of reference
3. Desk study
4. Preparation of the Inception Report
5. Review of existing similar manuals, documents and research outputs
6. Scoping of the RRN and preparation of the Draft Scoping Report
7. Review of the RRN Draft Scoping Report by the PMU and SWG
8. Preparation of the Final Scoping Report
9. Preparation of the Uptake and Embedment Plan
10. Implementation of the Uptake and Embedment Plan
11. Preparation of the Draft RRN
12. Review of the Draft RRN by the PMU and SWG
13. Preparation of the Final print-ready RRN
14. Launch of the RRN
15. Preparation of the Final Project Report

The ToR states that there could be changes from an RRN focussing on pavement design of LVRs to a RRN covering all aspects of LVR provision. This is a risk in that a significant change of scope of the project is likely if the latter is preferred. This would have both time and cost impacts.

The methodology presented here is based on the assumption that the required product from this assignment is a RRN focussing on only the pavement design aspects of LVRs and other aspects related to pavement design which include embankments and cuttings, drainage, climate resilience and life-cycle costing, rather than an overarching RRN on LVR provision with general sections like planning, construction, upgrading, rehabilitation, and maintenance. However, TRL has the capacity to deliver a high quality LVR RRN on the wider provision of LVRs if required.

For the stakeholder working group meetings, the launch, and other events that will be held during the course of the project, it is assumed that ReCAP will, on request, provide introduction letters that may be required by delegates to obtain entry visas to the countries where these events will be held.

The following section outlines details of each task.

2.2 Phase 1: Scoping of the RRN

2.2.1 Project Inception Stage

Task 1: Project Launch Meeting

TRL, in collaboration with ReCAP, convened a Project Launch Meeting on 15th May 2019. The meeting focused on the following areas, amongst others:

- Project team structure and mechanism of collaboration;
- Review and confirmation of the activity schedule;
- Proposed mandate for the Stakeholder Working Group (SWG); and
- Identification of key stakeholders.

Minutes of the Project Launch Meeting are shown in Annex 1, and have been verified and distributed to all participants.

Task 2: Constitution of and development of terms of reference for the SWG

A SWG will be constituted to guide the project. The SWG will offer feedback on the structure and content of the RRN, among other duties. TRL has proposed seven members for consideration for inclusion into the SWG an eighth member was proposed by ReCAP PMU. A preferred competence of the members of the SWG will be intimate knowledge in the application of the different methods used in the provision of LVRRs. The ToR suggested the composition of the SWG as:

- A representative from ReCAP PMU;
- A representative from ReCAP Technical Panel;
- A nominated representative from AfCAP;
- A nominated representative from AsCAP; and
- A maximum of two other LVR experts not part of the project team.

In addition to the above members, it is proposed that inclusion of representatives from developers and implementers of road engineering policy (government ministries/road agencies) in the target AfCAP and AsCAP countries is considered in order to foster easier uptake and embedment of the RRN once it is completed.

The project team has drafted terms of reference to guide members of the SWG on their roles and responsibilities on the project. These will be reviewed and approved by ReCAP before circulation to the SWG.

The role of the SWG shall include but not limited to the following:

- Assisting in the identification of local stakeholders/partners. These will include practitioners in the private sector, policy makers and implementers in government ministries and road agencies, among others.
- Reviewing the scoping of the RRN at the end of Phase 1.
- Technical review of the Draft RRN, including its layout.
- Attending all scheduled SWG meetings, preferably in person.
- Providing feedback/recommendations from their reviews to the TRL project team.

It is anticipated that two SWG meetings will be held – one in Africa, and the other in Asia. A provisional sum has been allowed in the TRL contract to cater for the costs of the SWG meetings including the venue, refreshments, delegate travel and accommodation.

Task 3: Desk study

This will involve the identification of relevant reference documents that will form the foundation for development of the proposed RRN. This will include a brief outline of the chapters of the key pavement design documents that will be referred to.

In addition, an assessment of the applicability of the RRN in the provision of sustainable mobility will be made. A questionnaire- and phone-based survey involving engineering practitioners in AfCAP and AsCAP countries will be conducted to investigate the degree of relevance of previously developed documents such as the 2013 AfCAP “Low Volume Rural Road Surfacing and Pavements: A Guide to Good Practice”; relevant ORNs and other existing documents. Successful implementation of this project task will require consultative discussions with engineering practitioners and policy makers in the countries where the documents have been applied.

Task 4: Preparation of Inception Report

This Inception Report has been prepared and covers the revised schedule of activities, a list of the pavement design methods being considered, terms of reference of the SWG, proposed members of the SWG, and a compilation of the reference documents identified during the desk study.

2.2.2 Scoping of the RRN and Preparation of Uptake and Embedment Plan

Task 5: Review of existing similar documents

The literature review will be undertaken in two stages. The first stage will focus on only documents that are relevant to the development of the RRN. This will involve a detailed analysis of the relevant documents that have been previously developed in order to assess their suitability for providing a foundation for the proposed RRN. The lessons learnt from their development, dissemination and uptake will also be synthesised. Existing documents relevant to the development of a broader RRN covering other elements of LVR provision will also be earmarked. After a decision has been made on whether the project output will be a broader RRN on LVR provision or a RRN for pavement design, the second stage of literature review will be undertaken to examine in more depth the documents that are relevant to the preferred project output.

Task 6: Scoping of the RRN and preparation of the Draft Scoping Report

The first stage of the scoping of the RRN will involve an evaluation of whether the proposed RRN should be an RRN that describes and assesses available pavement design methods or low volume roads in general.

The appropriate scope will be summarised into a draft Table of Contents (ToC) of the proposed RRN. The key composition of the draft ToC will be the different chapters and sub-sections of the proposed RRN. This ToC, together with the write-up from the scoping study will form the Draft Scoping Report which will be presented at a stakeholder meeting/workshop for discussion.

Task 7: Review of the RRN Draft Scoping Report by the PMU and SWG

The draft scope of the RRN and the ToC will first be sent to the PMU for initial review. Thereafter it will be sent to the SWG members before the SWG meeting that will be held at a venue yet to be decided. The scope and the ToC will be discussed in detail during the SWG meeting with the aim of getting comments, advice, and recommendations on the proposed RRN. If possible, the setting of this review will be a workshop held during an international research meeting in order to solicit for more feedback from a range of pavement design engineers and researchers.

This review meeting will also take advantage of the available audience to solicit for views on an effective approach for uptake and embedment of the RRN in their respective countries, based on their experience. This will feed into the development of the Uptake and Embedment Plan.

Task 8: Preparation of Final Scoping Report

Based on the feedback obtained from the review of the draft scoping and ToC of the RRN, the Draft Scoping Report shall be revised to generate the Final Scoping Report.

Task 9: Preparation of Uptake and Embedment Plan

The Uptake and Embedment Plan shall articulate the strategy for disseminating the RRN to the end user target countries. Previously, the rapid uptake and embedment of Overseas Road Notes (ORNs) was achieved through the exploitation of close ties between TRL and national governments as well as road authorities in developing countries.

It is expected that the RRN will be implemented directly in the execution of projects in the same manner that the ORNs have been used internationally. On the other hand, road authorities may extract technical information from the RRN to develop national manuals or update existing ones. The uptake and embedment plan will set out these activities and strategies in detail. These will include publishing the RRN on several websites including ReCAP, TRL, DFID and other platforms that make the RRN readily available from reliable online sources. It will be accompanied by some Technical Information Notes to guide the users in the application of the manual, which can be distributed electronically upon request. This will give confidence to the users and life to the RRN. In addition, TRL is regularly invited to partake, present and publish in many forums and on numerous platforms which will provide an ongoing opportunity to publicise and disseminate the RRN even after this project is completed.

On this basis, the project team will develop an Uptake and Embedment Plan that is founded on the following attributes:

- Awareness. Awareness of the development of the proposed RRN amongst its targeted user countries in Africa and Asia shall be promoted. The merits of the RRN will also be emphasised in the awareness process.
- Stakeholder involvement. Involvement of the developers and implementers of policy, such as government ministries and road authorities, to cultivate a sense of ownership of the project from its inception.
- Engagement. Relevant stakeholders of the RRN from ReCAP countries shall be consulted during project scoping (after the detailed table of contents has been prepared during the scoping stage – Task 7).
- Collaboration with DFID/ReCAP and other partners to implement dissemination drives that will be organised during the course of the project.
- Ownership. The project team shall work towards ensuring that the targeted end user countries assume a complete sense of ownership of the RRN by the end of the project duration.
- Innovation. New and innovative approaches shall be included in the RRN which will be aimed at making rural road design appropriate, effective and efficient.
- Initiative. The approach shall ensure that life-cycle costing become an integral part of the design process in order to attract the much needed investment in rural roads. The design approaches should ensure good value for money and good economic viability and sustainability.

The Uptake and Embedment Plan shall be discussed with the SWG and approved by ReCAP, DFID and ReCAP stakeholders before it is implemented.

2.3 Phase 2: Development of the RRN

Task 10: Implementation of the Uptake and Embedment Plan

The Uptake and Embedment Plan developed in Phase 1 of the project shall be implemented from the beginning of Phase 2 until the end of the project. It is envisaged that beyond the duration of the project, the target user countries will continue to assume ownership of the RRN and apply it in their engineering practice accordingly.

During the implementation of the Uptake and Embedment Plan, the project team will undertake the following tasks, amongst others:

- Launching of the completed RRN and associated training workshop in accordance with the provisional sum.
- Distribution of copies of the RRN to relevant stakeholders.

Task 11: Preparation of the Draft RRN

The drafting of the proposed RRN shall be carried out in a systematic manner in response to the terms of reference, ensuring that the developed document has the following characteristics, among others:

- Technically-sound content. The technical information provided in the proposed RRN shall be reliable and founded on evidence. This will build the required confidence amongst practitioners in regard to its application. In the absence of scientific evidence, international best practice shall be considered.
- Precise and concise. In line with the other road notes that TRL has developed, this proposed RRN will be accurate and based on robust research, concise so that the reader can easily locate and understand the relevant information they need, specific and easily understood.
- Graphical. Where applicable, user-friendly graphics (tables, graphs, diagrams etc.) shall be included in the RRN to aid interpretation and accurate application by practitioners.
- Design procedures shall be presented with worked examples for ease of comprehension.

Conflicting evidence will be evaluated and a decision taken by the team; critical cases will be debated by the SWG meeting.

The content of the proposed RRN will make reference to relevant standard software in pavement design (such as the UK DCP, WinDCP/AfCAP LVR-DCP).

Drafting of the RRN shall be undertaken in the following steps:

- i. Compilation of all pavement design methods – The authors shall, after reviewing existing literature and consultation with stakeholders, compile a list of the relevant pavement design methods for LVRRs that will constitute the proposed RRN in line with the approved ToC.
- ii. Preparation of a draft outline of the RRN – A draft outline of the proposed RRN shall be prepared detailing the relevant aspects of the pavement design methods that will be presented in the different chapters of the proposed RRN. .
- iii. Preparation of the Draft RRN – The team through crosspollination of knowledge and experience shall combine to draft the RRN in a coherent and collaborative manner.
- iv. Internal review of the Draft RRN. TRL recognises that internal review of project outputs often results into superior quality products, hence higher client satisfaction. Accordingly, the project team will schedule routine meetings to discuss and analyse outputs critically before sending them to the client. There will be no substitute for the physical presence of each expert during these meetings. Our experience from previous assignments has revealed that more effective feedback on work outputs is obtained in meetings involving face-to-face interaction rather than electronic communication. The team will endeavour to have face-to-face meetings frequently in preference for electronic media.

Task 12: Review of the Draft RRN by the PMU and then the SWG

The draft RRN will be submitted to the PMU for review. Following the review, comments will be addressed and the revised draft will then be circulated to the SWG. A SWG meeting will be scheduled to discuss the Draft RRN. In addition to the SWG meeting, the Draft RRN shall be circulated to the relevant stakeholders from the different countries where the RRN is likely to be implemented. The stakeholders shall be given the opportunity to scrutinise the Draft RRN and make contributions. A key point of discussion that is likely to emerge from these reviews is the level of detail to which the Draft RRN could have been written.

The contributions from the reviews shall be aggregated and synthesised for incorporation in the Final RRN.

Our expectation is that ReCAP and DFID would have reached an agreement on the ownership, copyright, and branding of the RRN by the time the review of the Draft RRN is completed.

Task 13: Preparation of the Final print-ready RRN

The comments and suggestions that will emerge from discussions in the review meetings/workshops will be incorporated into the Draft RRN to form the Final RRN.

Once the incorporation of comments is complete, the RRN will undergo internal review to ensure that all comments from the review have been addressed.

The Final RRN shall be converted to a ready-to-publish format using appropriate software. The authors shall then check the Final RRN for errors that may have occurred during conversion, especially tables, figures and formulae. Subsequently, it shall be branded according to the agreed DFID/ReCAP format and printed for distribution.

Task 14: Launch of the Final RRN

The Final RRN shall be launched in the presence of stakeholders. It is envisaged that the launch of the RRN will coincide with an international event with representatives from the targeted user countries.

The ToR made a provisional sum for printing 200 copies of the Final RRN. These copies will be printed in advance and disseminated at the launch or sent to partner countries.

Task 15: Preparation of the Final Project Report

Following successful launch of the Final RRN, the Final Project Report will be drafted. This will include a summary of the project, an outline of the uptake and embedment activities undertaken, challenges and lessons learnt, and suitable recommendations, amongst others.

3 Proposed project delivery schedule

3.1 Main tasks of the project

The main tasks of the project are outlined and described in Section 2.1.

3.2 Main reports

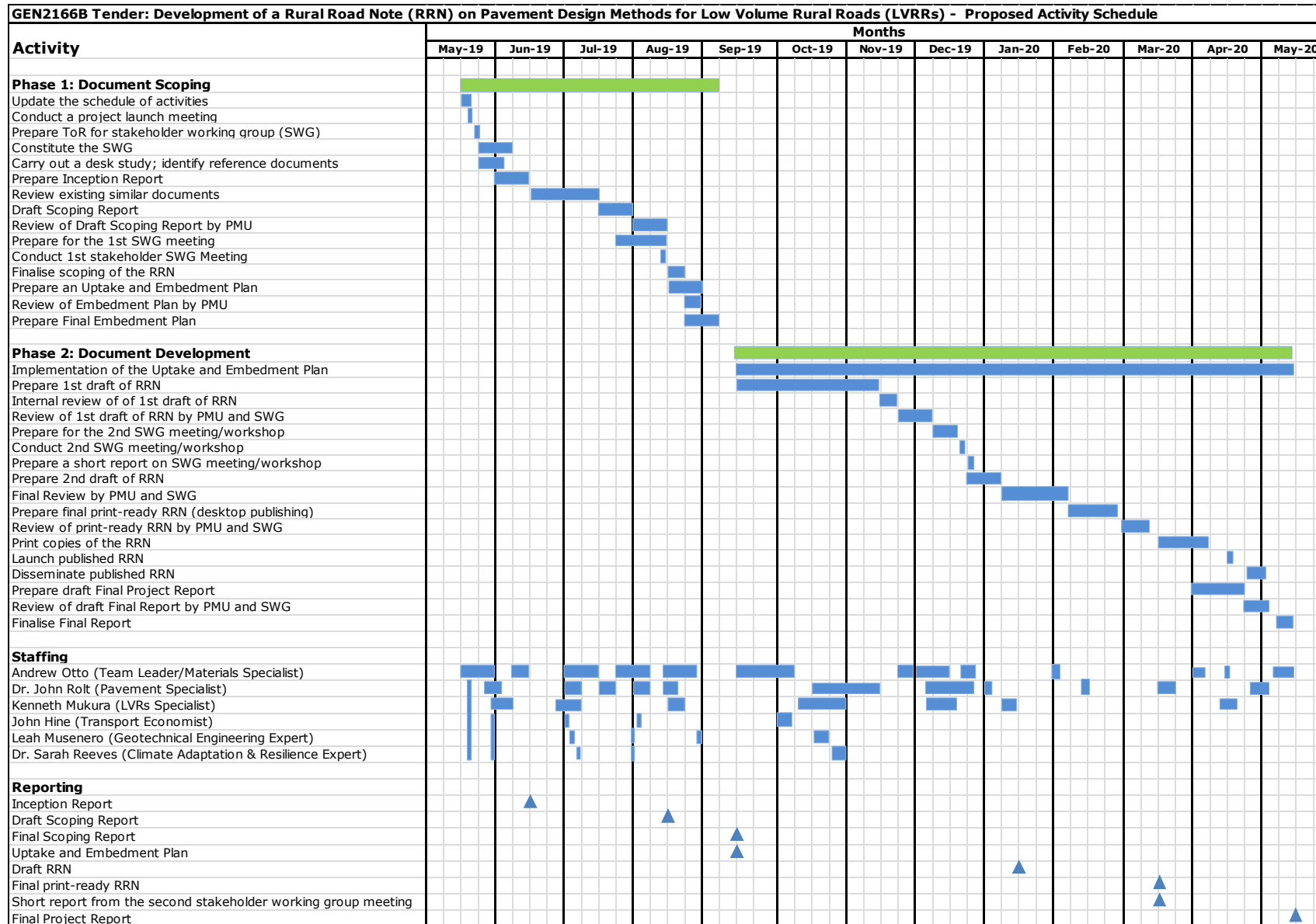
The following reports will constitute the main deliverables of the project:

1. Inception Report
2. Scoping Report
3. Uptake and Embedment Plan
4. Final Print-ready RRN
5. Final Project Report

3.3 Proposed schedule

The proposed project schedule is shown in Figure 1. The project commenced on 15th May 2019 and is scheduled to be completed by 20th May 2020. It is divided into 2 major phases, Phase 1 – Document Scoping and Phase 2 – Document Development. Phase 1 is estimated to last 4 months, whereas Phase 2 is estimated to last 8 months.

Figure 1 Proposed project delivery schedule



4 Progress to date

4.1 Launch meeting

The project launch meeting was held on the 15th May 2019. Minutes of the meeting are contained in Annex 1. The main resolution at the meeting was that TRL would propose the direction that the RRN should take (whilst taking into account the ToR) and this would be debated at the first SWG meeting. The SWG will then discuss the proposed content of the RRN and the drafting will then commence.

4.2 Desk study

A desk study was conducted to carry out a preliminary review of the documents that will contribute to the preparation of the RRN. Under ReCAP, many low volume roads manuals and guidelines have been produced. Therefore these documents will form a major part of the literature review. The preliminary review found that many of the manuals are similar, but the more recent manuals include significantly more information and refinements from previous manuals. Apart from this, there are a number of ongoing ReCAP projects that will provide useful information that will be used in developing the RRN. Lastly, there are key documents and other manuals that were briefly reviewed to ascertain what information could be obtained from them.

4.2.1 Key manuals

Following the desk study, the following manuals were selected for a detailed review for the development of the RRN:

- Administração Nacional de Estradas, 2016. Manual for the provision of low volume Roads. This manual was developed after the Ethiopia, Malawi, Uganda, and the Tanzania manuals. It therefore represents a manual which has undergone several refinements. Additionally it covers maintenance and climate resilience in appreciable depth.
- Ethiopian Road Authority, 2017. Design of Low Volume Roads. Addis Ababa, Ethiopia. This manual was a second iteration of the Ethiopia manuals of the year 2011. The manual comes in four parts and will be a major resource for use in the development of the RRN. Additionally, the subjects of slope stability for embankments and cuttings, retaining structures and bio-engineering methods for slope stability are covered extensively.
- Ghana Ministry of Roads and Highways, 2019. Manual for Low Volume Roads. This is a recent manual. It represents the efforts of a large team of reviews well-versed with West Africa low volume roads provision. The subgrade classification and materials specifications vary from that contained in other manuals.
- Dingen R and Cook J, 2018. Review of Low Volume Rural Road Standards and Specifications in Myanmar. ReCAP. DFID, UK. This review represents the typical South East Asia situation. It is authored by experts who have an extensive experience in the region and therefore covers subjects important to successful road provision in the region.
- Ministry of Works Transport and Communication Tanzania, 2016. Low Volume Roads Manual. Dar Es Salaam.

4.2.2 ReCAP Projects

Documents from the following ReCAP projects will be used in the development of the RRN:

- RAF2069A Development of Specifications for Low Volume Sealed Roads through Back Analysis. This project is looking at the performance of roads known to have performed well and learning from these roads to develop more fit-for-purpose specifications. The project is also reviewing the findings of previous studies in order to learn from these. It will therefore provide useful specifications of materials for inclusion in the RRN.

- **RAF2101A Road Materials and Aggregate Inventory Database.**
The project is developing a materials database framework for countries to better store their records of where road construction materials are located. The attributes of these materials will also be stored in this database. The study carried out a review of the current state of record keeping in the AfCAP countries.
- **GEN2014C Climate Adaptation: Risk Management and Resilience Optimisation for Vulnerable Road Access in Africa.**
This project is assessing the capacity of roads agencies to deal with climate change impacts on low volume roads. A Climate Adaptation Handbook and four associated guidelines have been produced that deal with vulnerability assessment, mitigation measures and construction and maintenance practices to adopt. Proposals from this study will be incorporated in the RRN.
- **GEN2018A Economic Growth through Effective Road Asset Management.**
The objective of the study is to foster sustainable improvements in asset management performance.. Lessons from good practice observed in this study will be used in the RRN.
- **RAF2128 Comparison of Cost-Effectiveness and Value-for-Money of DCP-DN Pavement Design Method for Low-Volume Roads in Comparison with Conventional Design.**
The study carried out an economic assessment of roads designed using the DCP-DN method. The performance of the roads evaluated will be useful for developing the RRN. In addition, the cost-benefit methods of evaluation used for the study will be discussed in the RRN.
- **GEN2132A Capacity Building and Mentorship for the Establishment and Implementation of Monitoring & Evaluation Programmes on Experimental and Long-Term Pavement Performance (LTPP) sections in Six AfCAP Countries.**
The study is assisting local country consultants and roads agencies to carry out long-term pavement performance monitoring of low volume roads. Useful results are being obtained from a number of countries. These results will be evaluated, selected and included in the RRN.

Major reference documents

1. TRL, 1993. ORN 31. A guide to structural design of bitumen surfaced roads in tropical and sub-tropical countries. 4th Edition, TRL Ltd, UK.

This is a highly successful document, though mainly targeted at high volume roads. The main principles used in a number of low volume roads documents are derived from this document. It is proposed that the RRN adopt the structure and style of this document.
2. Gourley C S and P A K Greening, 1999. Performance of low volume sealed roads: results and recommendations from studies in southern Africa. DFID/TRL Project Rep. PR/OSC/167/099, TRL, Crowthorne, Berkshire, UK.

This is a study that developed the CBR-based catalogue used in many of the AfCAP countries for pavement design of low volume roads. In conjunction to the catalogues, materials specifications for use in the pavement layers were also developed. This will form a major component of the RRN for the section on the CBR pavement design method of LVSRs.
3. Cook J R, Petts R C, and Rolt J, 2013. Low Volume Rural Road Surfacing and Pavements: A Guide to Good Practice. DFID, UK.

A study that reviewed documents used in the provision of low volume roads in both Africa and South-East Asia. It has a detailed discussion on the choice of different surfacings and pavement types. It also has a long list of useful reference documents concerning low volume roads.
4. Department of Transport, 1996. TRH4 Structural Design of Flexible Pavements for Interurban and Rural Roads. Department of Transport, Republic of South Africa, Pretoria.

This is the pavement design document used in South Africa. It therefore offers a different dimension to pavement design and it is therefore a valuable reference.

5. Department of Transport, 1985. TRH 14 Guidelines for Road Construction Materials. Pretoria, South Africa.

Materials for low-cost provision of low volume roads are becoming increasingly scarce. The document provides specifications for natural materials, cement treated materials and bituminous surfacings.
6. TRL, 2000. ORN 3. A guide to surface dressing in tropical and sub-tropical countries. TRL Ltd, for DfID, UK.

This document provides a concise method for the design and construction of surface dressing. Because of its conciseness, it has been adopted in many manuals. Therefore it will be the main document for use in the surface dressing section of the RRN.
7. Overby C, 1999. Guide to the use of Otta Seals. Publication No.93. Norwegian Public Roads Administration, Oslo, Norway.

Otta seal offers an alternative to crushed stone for the provision of thin bituminous surfacings. The document provides specifications for gravels that can be used for construction of Otta seal, design, and construction.
8. AFCAP, 2013. Guideline on the Use of Sand in Road Construction in the SADC Region. DFID, UK. Available at: <http://r4d.dfid.gov.uk/pdf/outputs/AfCap/AFCAP-GEN028-C-Sand-in-Road-Construction-Final-Guideline.pdf>

Sands are a major source of cheap and abundant road construction material. The document presents specifications for use of sand in road provision. The method of selection of suitable sands is important for inclusion in the RRN.
9. AFCAP, 2014. Review of Specifications for the Use of Laterites in Road Pavements. AFCAP/GEN/124, DFID, UK. Available at: <http://www.research4cap.org/Library/Pinard-et-al-Africa-2014-Review+Specs+Laterite+Pavements+Final-AFCAPgen124-v140525.pdf>

Laterites present another source of abundant material for road construction materials that have been shown to perform well. Lessons from the document will be incorporated in the RRN.
10. CIRIA, 1988. Laterite in road pavements. Special Publication 47. Construction Industry Research and Information Association, London, UK.

This is concise document that discusses the location, selection, testing and use of laterite in pavement design.
11. Rolt J K, Mukura K, Dangare F and Otto A, 2013. Back analysis of previously constructed rural roads in Mozambique. African Community Access Programme Project MOZ/001/G. CPR 1612. DFID, UK.

This study in Mozambique reviewed the performance of low volume sealed roads. A major finding of the study was that failures of low volume roads are mainly induced through surfacing failures. Lessons from this study will be incorporated in the RRN.
12. Kleyn E G and Savage P F, 1982. The application of the pavement DCP to determine the bearing properties and performance of road pavements, Proc Int Symp on Bearing Capacity of Roads and Airfields, Trondheim, Norway.

This is a paper discussing the original DCP-DN method. It will act as a major reference for incorporating the method into the RRN.
13. Pinard M I, 2012. Performance Review of Design Standards and Technical Specifications for Low Volume Sealed Roads in Malawi. AFCAP Project Report MAL/016.

The document presents the results of a study that was used to adapt the DCP-DN design method for use in Malawi. It will also act as a major reference for incorporating the method into the RRN.

14. TRL, 2006. UKDCP 3.1 Manual Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer.
This manual presents the steps for the use of the UKDCP 3.1 software for assessment of roads and design of low volume roads pavements using the DCP-CBR method.
15. TG 2 (2nd edition), 2009. Bitumen Stabilised Materials, Asphalt Academy Relevance of Appendix A (Materials Classification System) and Appendix C (Pavement Number Structural Design Method) available from the Sabita (Southern Africa Bitumen Association).
The use of bitumen stabilised materials is a good alternative whenever waterproofing of inferior materials is required without the cracking that is usually associated with cement-stabilised materials. This is therefore a key reference document.
16. TRL, 1997. Overseas Road Note 14. Hydrological Design Manual for Slope Stability in the Tropics. Overseas Centre, TRL, Crowthorne, Berkshire, UK.
Slope stability, laboratory investigations.
17. Howell, 2008. Development of Local Resource Based Standards. Study of Road Embankment Erosion and Protection. Technical Paper No. 6. SEACAP 19. Unpublished Project Report.
Assessment of road slope and embankment stability; slope and embankment conservation, protection & drainage.
18. Geotechnical Engineering Office. 2011. Technical Guidelines on Landscape Treatment for Slopes. GEO Publication No. 1/2011, Civil Engineering and Development Department. The Government of the Hong Kong Special Administrative Region.
Soil and rock slope protection, slope drainage, design and construction of new embankments, reinforced fill slopes, retaining walls, landslide repair works, maintenance of slope protection works.
19. TRL, 1997. Overseas Road Note 16. Principles of Low Cost Road Engineering in Mountainous Regions. Overseas Centre, TRL, Crowthorne, Berkshire, UK.
Mitigation of impact of geotechnical hazards; planning and design for road construction in mountain areas; geotechnical investigations for LVRRs; sampling and laboratory testing; geotechnical analysis and design; soil & rock slope stability analysis and design; retaining structures for LVRRs; foundations for small structures; slope protection and slope stabilisation.
20. Lim, S. M., Wijeyesekera, D. C., Yek, C. S. (2015). Slope Stabilisation for Rural Roads from a Geotechnical Perspective. Proceedings of the 25th World Road Congress: Roads and Mobility – Creating New Value from Transport. Seoul, South Korea. 2 – 6 November 2015. 5(1), 4190 – 4204.
Ground improvement for LVRRs; geotechnical investigations for LVRRs.
21. TRL, 2012. NIAF2 scoping study on improving the resilience of Nigerian roads to climate change. This is an unpublished report by TRL included identification of potential impacts to Nigerian roads and actions to adapt.
22. Austroads, 2009. Guide to Pavement Technology. Part 6, Unsealed Pavements. Sydney.
Discusses economic appraisal of low volume roads projects. It presents a life-cycle costing method based on construction and maintenance costs.
23. Cundill M, Hine J and Greening P A, 1997, The Costs of Maintaining and Repairing Vehicles in Developing Countries, TRL Report 256, Transport Research Laboratory, Crowthorne.
Discusses the effect of road roughness on vehicle operating costs and how this can greatly exaggerate benefits.
24. Gourley C, Toole T, Morosiuk G and Hine J, 2001. Cost Effective Designs for Low Volume Sealed Roads in Tropical and Sub Tropical Countries. TRL Annual Research Review, Crowthorne.

The document discusses user costs using HDM-4 and additionally discusses how total transport costs may be considered.

25. Odoki J, 2016. Case Study: HDM-4 adaption for analysing Kenya Roads. International Conference on Transport and Road Research, March 2016, Mombasa Kenya.

Discusses recent approaches to calibration of HDM-4.

26. US Department of Transportation, 1998. Life-Cycle Cost Analysis in Pavement Design –In Search of Better Investment Decisions- Federal Highway Administration Pavement Division Interim Technical Bulletin Set 1998. Publication FHWA-SA-98-079.

Discusses consideration of road user costs associated with disruption during construction and maintenance in their approach to pavement design, however, no numerical evidence is presented.

27. World Bank, 2000. Highway Development and Management Model (HDM-4), jointly published by World Bank, Washington, D.C, and the World Roads Association (PIARC), Paris.

Provides a comprehensive approach in which fine differences in road design can be appraised, within an economic framework and the effects on road deterioration, future maintenance, and vehicle operating costs (VOCs) assessed over the lifetime of the pavement.

4.2.3 Documents from multi-lateral funders

Other multi-lateral and bilateral funders of road infrastructure such as the World Bank, Asian Development Bank, European Bank of Reconstruction and Development and Nordic Development Fund have produced guidance documents, tools and technical reports as well as funding technical support projects addressing different aspects of climate resilience in specific countries. Some are focused on roads or transport, others are more general. The good practice and learnings from these other projects will be reviewed and incorporated into the RRN where appropriate. These include:

- World Bank: Making transport climate resilient, 2010 – 3 country reports were produced for Ethiopia, Mozambique and Ghana. Available at: <http://documents.worldbank.org/curated/en/735341468008412331/pdf/693920ESW0P10200monitorinMZ0final00.pdf>

The document presents the analysis of various climatic scenarios and their impact on road maintenance in the 3 study countries. It recommends various mitigation measures and policies for coping with climate change.

- World Bank: Integrating climate change into road asset management, 2017 <http://documents.worldbank.org/curated/en/981831493278252684/pdf/114641-WP-ClimateAdaptationandAMSSFinal-PUBLIC.pdf>

The document discusses the disparity in the geographical distribution of climate change effects in the world. It shows that developing countries are affected more than developed countries. It further discusses the impacts of slow-changing events as compared to the impact of shock events.

- Asian Development Bank: Guidelines for Climate Proofing Investment in the Transport Sector: Road Infrastructure Projects, 2011. <https://www.adb.org/documents/guidelines-climate-proofing-investment-transport-sector-road-infrastructure-projects>

This publication presents a step-by-step methodological approach to assist project teams to incorporate climate change adaptation measures into transport sector investment projects. It will therefore be of great importance in drafting of the RRN.

- Nordic Development Fund: Climate Resilient Roads, Cambodia Rural Roads Project. https://www.ndf.fi/sites/ndf.fi/files/attach/conference_version_-_climate_change_resilient_roads.pdf

The document stands out by presenting elaborate sketches of road prisms showing changes that can be adopted in order to improve climate resilience of the road pavement.

- United States Agency for International Development: Climate-Resilient Development Framework, 2014. Available at: <https://www.usaid.gov/climate/climate-resilient-development-framework>

The document offers a simple yet robust five-stage approach to help decision-makers and development practitioners at all levels systematically assess climate-related risks and prioritize actions that promote climate-resilient development.

- The PIARC/World Roads Association international framework for the climate change adaptation of roads. Available at: <https://www.piarc.org/en/order-library/23517-en-International%20climate%20change%20adaptation%20framework%20for%20road%20infrastructure.htm>

The framework was developed to help member countries adopt a consistent approach to analyse the effects of climate change on their road networks and thus help them identify, propose and prioritize the most appropriate measures to mitigate risks associated with extreme weather events.

- The PIARC Technical Committee on adaptation strategies and resilience draft reports (these are due to be published in October 2019, but as a member of the committee TRL has access to these). They provide good practice and case studies in relation to climate change adaptation of roads.
- CEDR projects – RIMAROCC, ROADAPT, SWAMP, WATCH and DeTECToR. Although aimed at European (developed country) road authorities the techniques developed are valid for any road authority and transferable elements will be identified. <https://www.cedr.eu/strategic-plan-tasks/research/>
- Resilience Shift is an ongoing programme of work funded by the Lloyd’s Register Foundation that is producing tools and guidance to help increase the resilience of infrastructure. TRL has produced the road and rail primers on incentivising resilience, there are also other tools and guidance not specific to transport that may be useful. www.resilienceshift.org

Other documents have been identified from literature sources and may also be used in the production of the RRN. The list of these documents is included in Annex 3.

4.3 Proposed Table of Contents for the RRN

It is proposed that the structure of the RRN follow very closely that of Overseas Road Note 31. This will be discussed at the first SWG meeting and consensus will be sought.

The RRN will discuss how each of the four main pavement design methods (the CBR Method, the Structural Number Method, the DCP-DN method, and the DCP-CBR Method) deals with the following key topics:

- Design process and considerations
- Preliminary road evaluation
- Subgrade assessment
- Traffic estimation
- Embankments and cuttings
- Materials specifications
- Surfacing
- The design catalogues
- Drainage
- Climate resilience
- Life-cycle costing
- Limitations of the method
- Guidance on applications of the method

The RRN will emphasise and give guidance on the areas of life-cycle costing, and climate resilience – a relatively new area that may not have been included in some of the older source documents.

This draft table of contents will be further refined at the scoping stage first after the literature review before review by the PMU. It will then be circulated to stakeholders for feedback and thereafter presented at the first SWG meeting. After discussions at the first SWG meeting, the table of contents will be further refined.

4.4 The Stakeholder Working Group

The terms of reference require that a Stakeholder Working Group (SWG) be identified to guide and support the project. It further states that the composition of the SWG has to be agreed and approved by ReCAP and DfID. The requirement is that the group should comprise minimum of six members. Eight members have been proposed as shown in Table 1.

Table 1 Proposed members of the Stakeholder Working Group

| No. | Representatives as required by ToR | Proposed individual to fill the position | Region/Role Represented |
|-----|--------------------------------------|--|--|
| 1 | ReCAP Representative | Nkululeko Leta | ReCAP PMU |
| 2 | ReCAP Technical Panel Representative | Tony Greening | Technical Panel/Pavement design expert/Manual development |
| 3 | AfCAP Representative | Patrick Bekoe | West Africa/Government representative/Practitioner/Academic |
| 4 | AsCAP Representative | Dang Tran | Southeast Asia/Academic Institutions |
| 5 | LVR Expert 1 | Luis Fernandes (ANE – Mozambique) | Southern Africa /Roads Agency Representative/Practitioner |
| 6 | LVR Expert 2 | Tonny Mugenyi (MoWT – Uganda) | Eastern Africa/ Government Representative |
| 7 | LVR Expert 3 | Jasper Cook | Southeast Asia LVR Expert /Consultant |
| 8 | LVR Expert 4 | Mike Pinard | East and Southern Africa/LVR Pavement design expert/Manual development expert/consultant |

A pull-out of the Terms of Reference to be given to the proposed members of the SWG is contained in Annex 2.

5 Proposed way forward

The next key tasks of the project that the team will embark on immediately are:

- ReCAP to circulate the ToR of the proposed SWG members to the intended members and seek their agreement to be part of the SWG
- TRL to commence on a detailed literature review of the source documents
- TRI to commence on preparation of a more detailed proposed table of contents for the RRN that will be circulated to the PMU and the stakeholders.

The team proposes that the RRN should be written in such a way that it is in itself a concise pavement design document applicable to low volume rural roads in a number of countries. It is important to keep it concise so that it does not exceed the existing low volume roads manuals being used in the different countries.

Annex 1 Minutes of Launch Meeting

Launch Meeting for GEN2166B Development of a Rural Road Note (RRN) on Pavement Design Methods for Low Volume Rural Roads

Time: 10:30 – 11:40 hrs. 15th May 2019

Venue: Zebra Meeting Room, TRL Crowthorne House. Nkululeko Leta by remote attendance (Teleconference)

Participants:

- Nkululeko Leta
- John Rolt
- Kenneth Mukura
- Andrew Otto
- John Hine
- Leah Musenero
- Chloe McAuley

Agenda

1. Introduction of Project team members
2. Outline/Summary of planned project activities
3. Immediate tasks to be undertaken
4. Clarifications
5. Inception Report submission date
6. AOB

Minutes of the Launch Meeting

| Item | Issues Discussed | Conclusions/Action By |
|--|---|---|
| 1. Introduction of project team members and opening remarks. | <p>Introductions of the project team and opening remarks. Sarah Reeves (Climate Resilience and Adaptation Expert) was absent on an out-of-country commitment.</p> | <p>The project is an important one intended to produce a document that provides guidance to engineers on key aspects of pavement design methodologies</p> <p>Both parties are happy that the full team is available; know each other and communicating effectively with each other.</p> |
| 2. Outline/Summary of planned project activities | <p>Project remains unchanged from that included in the Technical Proposal</p> <ul style="list-style-type: none"> • Prepare ToR for the Stakeholder Working Group (SWG) • A desk study to identify and review relevant documents for the assignment • Constitution of the SWG • Scoping study to establish stakeholder requirements • Conduct SWG workshops • Draft the Document • Review internally and externally • Launch and Disseminate | TRL/ReCAP/SWG |
| 3. Immediate tasks to be undertaken | <p>Prepare the ToR for the SWG</p> <p>Propose members of the SWG</p> <p>Carry out the desk study to collect relevant information and documentation.</p> | <p>TRL to prepare proposed SWG members and their ToR as necessary</p> <p>ReCAP to review proposed members and ToR</p> <p>TRL to carry out the desk study and seek assistance with sourcing documents and reports from ReCAP, where necessary</p> |
| 4. Clarifications | <p>a. What is the expectation of ReCAP?</p> | <p>The expectation is as outlined in Section 2 of the ToR.</p> <p>To compile RRN consisting of LVR design methods and provide key details for each method.</p> <p>RRN to provide relevant guidance for selection of appropriate design methods and provide references for</p> |

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| | | users to access relevant design manuals and specifications when carrying out the actual design. |
| | b. Bullet 3 of Section 3.1 of the ToR seems to imply that the RRN should include all major aspects of low-volume road provision and not only pavement design methods. | <p>ReCAP perspective is that all that is mentioned in the bullet 3 of Section 3.1 should be discussed for each of the pavement design methods.</p> <p>Design methods to be obtained from source documents and referenced.</p> <p>Geometric design is not a major requirement of the RRN.</p> <p>The final say on the nature and content of the RRN will be based on what the stakeholders agree.</p> |
| | c. Should the RRN refer to generic documents or contain details? | <p>The RRN should make reference to source documents or design manuals. It should be a guideline for the selection of the various design methods.</p> <p>The team is of the opinion that a rural road note that provides pavement design methods, using the most up-to-date knowledge, for design engineers is a more appropriate document.</p> |
| | d. Findings of the Back Analysis Project may override some of the specifications in existing reference documents. | Findings of the Back Analysis Project should be included in the RRN. |
| | e. The existence of an RRN and country manuals may confuse the users of the manuals. | <p>The timing of the projects is not the best, the RRN should have come before the country manuals but nevertheless the SWG meeting will help in clarifying any confusion.</p> <p>The RRN should have recommendations of which methods should be applied where and when.</p> <p>The RRN needs to clearly state what its purpose is and how it complements current manuals.</p> <p>Best methods could be those based on sufficient data as long it is done in an objective way.</p> |

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| | | AASHTO Rehabilitation manual also compares similar methods of rehabilitation design. Perhaps RRN should take on such a structure. |
| | f. Will the RRN target those with existing manuals or will it be generic in nature? | Countries with manuals are having difficulty with selecting which of the pavement design methods to use. So the RRN should address this and give strong guidance on life-cycle costing. |
| | g. Many design methods provide catalogues, should we compare the catalogues? | There is a need for the team to brainstorm this and propose a way forward but the final decision will be taken after consultation with the stakeholders. |
| | h. The ToR states that the successful tenderer will propose members of the SWG. One from the ReCAP PMU, 1 from the Technical Panel, 1 from an AfCAP country, 1 from an AsCAP country and 2 LVR Experts. It appears that TRL will only be able to propose 2 LVR Experts since the other 4 positions are more or less fixed, is this case? | TRL should feel free to propose the 2 or more SWG members that are not already identified, as the ToR suggest a minimum of 6 members. |
| | i. What is the limiting number of vehicles per day for a road to be defined as LVR? | TRL should propose a refined definition that will be debated and adopted. Evidence and findings from other studies such as the Back Analysis will be useful in this. |
| | j. Will there be a possibility to reallocate some of the provisional sums to experts' time in order to ensure more input towards producing this important document? | TRL should make a proposal. This will be considered on merit and a decision will be made. |
| | k. TRL intends to develop a framework for management of Provisional Sums. Will this be acceptable to ReCAP? | The framework should be developed by TRL and submitted to ReCAP for consideration. |
| | l. Will SWG members be remunerated for their time (fees) inputs to the process? | The participation of the SWG members is supposed to be on a voluntary basis. Unless stipulated in the ToR, no payments of fees will be made. Travel expenses, |

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|-------------------------------------|---|---|
| | | accommodation, meals will however have to be catered for under the provisional sum. |
| 5. Inception Report submission date | | The agreed submission date for the Inception Report by TRL is 17 th June 2019. |
| 6. Final Remarks | Both parties to continue communicating with each other for a fruitful project delivery. | TRL/ReCAP |

Annex 2 Draft Terms of Reference for Stakeholder Working Group

Terms of Reference for the Stakeholder Working Group (RRN GEN2166B)

Background

The consolidation of pavement design methods underpinning the various national Low Volume Road (LVR) manuals that have been developed in DFID-funded rural transport programmes such as Research for Community Access Partnership (ReCAP), South East Asia Community Access Programme (SEACAP), Africa Community Access Programme-1 (AfCAP-1) is a worthwhile initiative. Under the ReCAP programme LVR manuals covering pavement design have been developed for several countries in Africa (Ethiopia, South Sudan, Zambia, Tanzania, Mozambique, Malawi, Kenya, Ghana, Sierra Leone and Liberia). In Asia, the Bangladesh LVR design manual has been reviewed and revised in line with the latest LVR design philosophy and a new manual is being developed for Myanmar. Most of these manuals were developed with reference to existing documents such as Low Volume Rural Surfacing and Pavements – A Guide to Good Practice; Design Manual for Low Volume Sealed Roads Using DCP-DN for Malawi; TRL’s UKDCP 3.1 Manual Measuring Road Pavement Strength and Designing Low Volume Sealed Roads (LVSRs) using the Dynamic Cone Penetrometer; TRL Overseas Road Note (ORN) 31; Southern African Development Community (SADC) Pavement Design Guidelines; among others.

In addition to the manuals, several regional research projects relating to pavement design of Low Volume Rural Roads (LVRRs) have been undertaken under the ReCAP programme. These research projects include the Development of Guidelines and Specifications for Low Volume Sealed Roads through Back Analysis (RAF2069A) – which is being carried out by TRL; Road Materials and Aggregate Inventory Database (RAF2101A); Climate Adaptation: Risk Management and Resilience Optimisation for Vulnerable Road Access in Africa (GEN2014C); among others. With the ReCAP programme due to complete in 2020, it is essential that the LVRR pavement design methods and aspects that are covered in the different national LVR manuals are integrated and aligned with findings from the regional research projects on LVRRs, into one document. This proposed project on the ‘Development of a Rural Road Note (RRN) on Pavement Design Methods for Low Volume Rural Roads’ will therefore address this need for consolidation of information on pavement design of LVRRs.

Description of the project

Aim of the Project

The overall objective of this project is to develop a concise Road Note on the Pavement Design Methods currently in the designers’ “tool box” for LVRRs.

The specific objectives will include:

- Identifying and reviewing suitable reference documents for the development of the RRN;
- Outlining all available methods that can be used for pavement design of LVRRs;
- Demonstrating the limitations of each design method including the environment in which the methods are most suitable for application;
- Providing procedural guidance for application of the pavement design methods; and
- Assessing the current status of the reference documents and indicating any updates that need to be made in order to make them compatible with the RRN.

The proposed RRN will not only enable practitioners to access all the relevant information on pavement design methods for LVRRs in one document but also support structuring and implementation of future regional projects in the African and Asian continents. Moreover, its enrichment with the latest findings from on-going research projects will add value and relevance in the design process of LVRRs. The ideal RRN would be a precise and concise document, whose content can easily be retrieved and applied by design engineers.

It is expected that the final RRN will not exceed 200 pages.

Scope of Work

The project will be undertaken in two phases:

- Phase 1 – Document scoping
- Phase 2 – Document development.

The total project duration is a maximum 12 months (starting in May 2019 and ending in May 2020) and it is anticipated that Phase 1 will be completed by no later than four months.

Phase 1 – Document Scoping

The following tasks are anticipated as part of Phase 1 of the project:

- Inception report including a desk study to identify the relevant reference documents that would form the foundation for the RRN;
- Survey to assess the application of a RRN of this nature with the overall sustainable mobility picture. This would include an analysis of the use and relevance of previously developed documents such as the 2013 AfCAP “Low Volume Rural Road Surfacing and Pavements: A Guide to Good Practice”; existing relevant Overseas Road Notes (ORNs) and other existing documents to assess what lessons were learnt from their development, dissemination and uptake; and whether they could provide a suitable framework/foundation for the proposed RRN;
- Outline of the proposed scope of the document and Table of Contents for the RRN. This will include an assessment of whether the focus should only be on the pavement design methods of LVRs or whether it should be expanded to look at the design implications on the broader provision of LVRs. The broader RRN would then need to include general sections on planning, construction, upgrading, rehabilitation, maintenance, geometric design for provision of low volume roads
- Identification of a stakeholder working group (SWG) to support and guide the project that would need to be agreed and approved by ReCAP and DFID.
- One stakeholder working group meeting to agree on the scope of the document. This could be linked to an international event to obtain broader feedback;
- Recommendations and agreement with ReCAP, DFID and ReCAP stakeholders on the proposed scope of the document;
- A plan for the uptake and embedment of the document. This will include a launch of the RRN at the end of phase 2 and uptake and embedment initiative that can be undertaken as part of this project. The plan should also include uptake and embedment strategies beyond the tenure of this project that would need to be funded outside the scope of this project.

Phase 2 – Document Development

This phase will include:

- Compilation of the draft RRN in the agreed format for review.
- Stakeholder working group meeting/workshop to discuss the contents of the draft manual and provide guidance on the finalisation of the RRN.
- Preparation of a final DTP-ed, print-ready manual for distribution in electronic format through open access channels.
- Printing of 200 hard copies for distribution.
- Implementation of the uptake and embedment plan approved at the end of Phase 1 that would include a launch and dissemination of the RRN (including distribution of the hard copies). The document launch could be linked to a major international event.

Deliverables/Reports

The following deliverables are required:

- An Inception Report in which a detailed programme and work plan for delivering the RRN is confirmed and will include a desk study of relevant reference documents to be used in the compilation of the RRN;
- A Draft Scoping Report for presentation at a stakeholder workshop/meeting;
- A Final Scoping Report at the end of Phase 1 outlining the proposed scope of the document agreed with ReCAP, DFID and stakeholders;
- An Uptake and Embedment Plan to disseminate the RRN;
- A Draft RRN with the approved branding and format for presentation at a stakeholder workshop;
- A Final print-ready RRN on Pavement Design for LVRs;
- A Final Project Report to include uptake and embedment activities undertaken as part of the project.

Duties of the Stakeholder Working Group Members

The tasks of each member of the SWG include, but are not limited to the following:

1. Attending all scheduled SWG meetings, most preferably in person or through acceptable media;
2. Providing technical advice and any recommendations on the structure, layout and contents of the RRN. This could also include inputs to the Uptake and Embedment Plan.....
3. Reviewing the scoping of the RRN at the end of Phase 1. This will include a critical review of its structure and proposed content to ensure a concise document is produced;
4. Assisting in the identification of local stakeholders/partners and soliciting feedback from them to enhance the quality of the RRN. These will include practitioners in the private sector, policy makers and implementers in government ministries and road agencies, among others;
5. Alerting the project team of literature and other relevant documents that could add value to the RRN. This may include assisting the project team in obtaining such documents;
6. Conducting technical reviews of the Draft RRN, including its technical content and layout. The feedback shall be of constructive nature giving leads and technical advice;
7. Resolving technical issues that could delay progress of the drafting of the RRN. Once brought to notice by the project team, the SWG shall review, consider available options and then advise on the way forward for the consultants to proceed;
8. Provide feedback to ReCAP PMU on outcomes of workshops; and
9. Be an advocate for the final RRN in order to promote its uptake and embedment.

Members

The SWG has been selected to include only members who have experience in the design, maintenance, operation and management of low-volume roads. The team should also comprise individuals who have had intimate involvement in the development of technical documents and manuals.

The composition of the SWG shall be as follows:

1. A representative from ReCAP;
2. A representative from ReCAP Technical Panel;
3. A nominated representative from AfCAP;
4. A nominated representative from AsCAP;
5. A maximum of two other LVR experts, preferably with AfCAP and AsCAP experience, not part of the project team; and

6. Representatives from government ministries/road agencies in the target AfCAP and AsCAP countries.

Frequency of Meetings

There will be two SWG meetings. The first meeting will be to agree on the scope of the RRN. This could be linked to an international event to obtain broader feedback. Therefore the venue for this has not yet been decided. This is scheduled to take place in August 2019. One possible event could be at the Back Analysis Regional Workshop.

The second SWG meeting will focus on discussing the contents of the Draft RRN and provide guidance on its finalisation. This is scheduled to take place in November/December 2019 at a venue yet to be decided.

Associated Costs

The Consultant (TRL Limited) will cover the costs of the SWG meeting venue including meals and refreshments, and accommodation. Travel costs and remuneration will be covered through a separate arrangement between ReCAP and the SWG members.

Annex 3 Additional list of references identified for the use in drafting the RRN

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